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See Fig. 4, Fig. 5

1115834 COMPLETE SPECIFICATION
1 SHEET

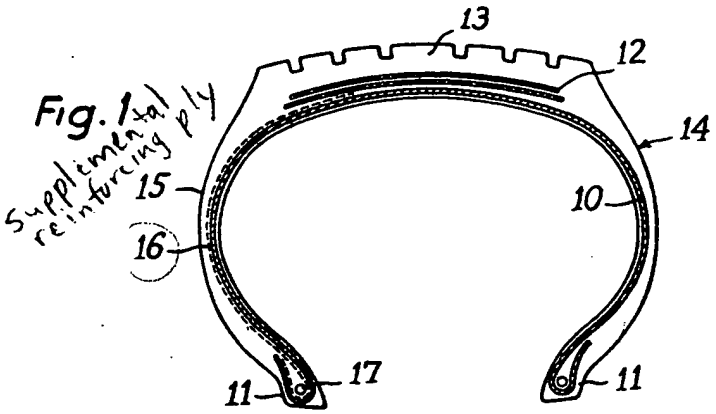

Fig. 1

Supplemental reinforcing ply

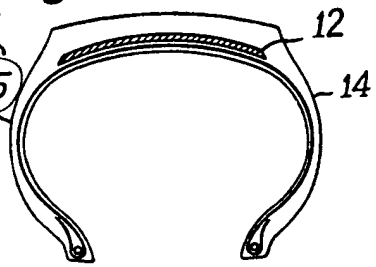

Fig. 2

higher hardness rubber or thicker than 14

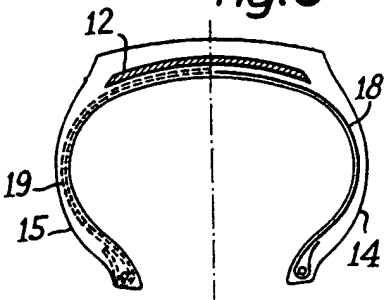

Fig. 3

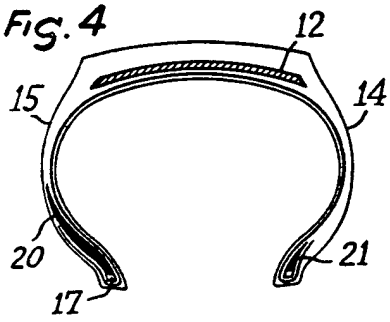

Fig. 4

radial extent • apex filler and/or higher hardness

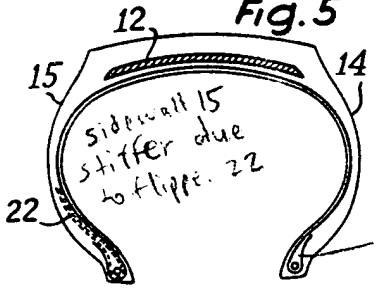

Fig. 5

no flipper or only a flipper of "ordinary dimensions"

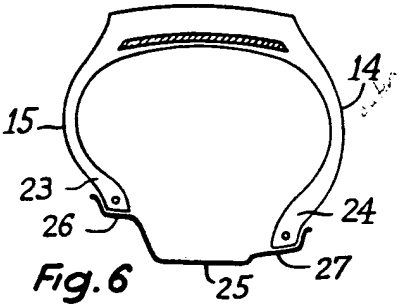

Fig. 6

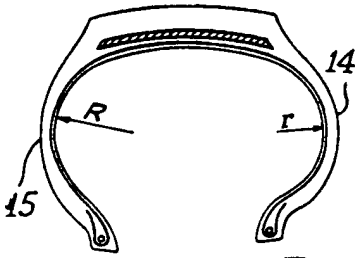

Fig. 7

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,115,834

1,115,834

Date of Application and filing Complete Specification: 20 May, 1966.
No. 22646/66.
Application made in France (No. 17831) on 20 May, 1965.
Complete Specification Published: 29 May, 1968.

Index at acceptance: —B7 C(3B7, 3B9, 3B12, 3J, 5H)

Int. Cl.:—B 60 c 9/00

COMPLETE SPECIFICATION

Improvements in or relating to Pneumatic Tyres having a Breaker Layer

We, PNEUMATIQUES, CAOUTCHOUC MANUFACTURE ET PLASTIQUES KLEBER-COLOMBES, a French Body Corporate, of Place de Valmy, 92 Colombes, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in pneumatic tyres with supple side walls and with a tread reinforcing breaker layer, this generally being obtained by using a radial cord carcass and an inextensible and rigid breaker layer placed between the carcass and the tread. The breaker layer has for its main effect to reduce wear and tear in use of the tread by eliminating a considerable part of the superfluous movements of the tread surface in contact with the ground. The radial cord carcass gives the tyre more supple side walls than carcasses of the cross-ply type and thus ensures comfort during running by compensating for the inherent stiffness of the breaker layer reinforcement.

On the other hand, these supple side walls have the disadvantage that the flexibility of their sides renders the tyre more sensitive to transverse strains, for example, when the vehicle is being driven round a bend or is subjected to side wind. Attempts have thus already been made to reduce this lateral flexibility by stiffening one part of each of the side walls, but this at the same time tends to reduce their radial suppleness and consequently comfort.

The invention has for an object improvements enabling the tyre to be best adapted to the various running conditions, particularly when cornering.

According to the invention there is provided a pneumatic tyre comprising a circumferential inextensible breaker layer disposed underneath the tread, wherein at least the radial inner part of one of the side walls is reinforced so that the said reinforced side wall presents a radial suppleness which is less than that of the other side wall. In such a tyre the lateral movement of the whole of the tyre with respect to the rim is reduced, whilst preserving its qualities of comfort. Numerous means may be utilised for practising the invention as will be seen from the description below of several embodiments.

A tyre according to the invention has an asymmetrical construction with respect to its mid-circumferential plane, and this can introduce a drift whilst running along a straight line but is not awkward in general because this drift can be compensated for by mounting these tyres in pairs symmetrically with respect to the longitudinal axis of the vehicle and/or by giving the wheels of the vehicle suitable settings for compensating at least partially for this drift. The more supple side wall of the tyre is preferably placed on the outboard side of the vehicle, but in certain cases the reverse mounting can be adopted.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show radial cross-sections through seven constructions according thereto, given purely by way of example. In all these drawings, the outboard side of the tyres is located on the right hand side of the drawings.

In the case of Figure 1, the tyre comprises a carcass 10, beads 11 reinforced by metal wires 17, a breaker 12 which is substantially inextensible in the circumferential direction and substantially rigid, placed on the carcass underneath the tread 13 and side walls 14—15 covering the sides of the carcass. Said carcass is constituted by one or more

[*Price 4s. 6d.*]

superimposed plies of parallel cord fabric (fabric without weft or with a slight weft constituted by parallel cables embedded in a thin layer of rubber), the number of these plies depending upon the dimensions of the tyre and the desired strength. The cords of the plies of the carcass 10 are oriented along directions passing through radial planes of the tyre and the edges of the plies are usually turned around the wires of the beads 11 so that the cords of the carcass are arranged in radial arches from bead to bead. The breaker 12 may, in particular, be constituted by one or more pairs of superimposed cross-laid layers of parallel cord fabric having approximately the width of the tread running surface and whose cords symmetrically form a very small angle with respect to the mid-circumferential plane of the tyre, for example, from 0 to 20°C. This is one of the most simple constructions of breaker layer but it is obvious that other methods of construction may be used from numerous constructions which have already been proposed in the prior art. In any case, this breaker layer has such a circumferential length that it prevents radial expansion of the carcass beyond a predetermined amount so that it flattens the carcass in its crown region and so that it is placed under tension by the pressure of inflation.

The side wall 15 of the tyre is rendered less supple than the side wall 14 in the radial direction (i.e. more resistant to flexion under load), by the fact that the carcass comprises in this area at least one supplementary reinforcing layer 16 extending between the breaker layer 12 and main carcass plies as far as the bead 11 where it is turned around the wire 17. This layer 16 may be made of parallel cord fabric disposed in the radial direction or laid on the bias. When it is constituted by a radial cord layer, it may be simply produced by extending the main carcass ply as far as the shoulder of the tyre instead of stopping it in the bead corresponding to the side wall 15. If there is a plurality of layers 16, their cords may be crossed with respect to one another and with respect to those of the main carcass plies. According to another variation, this layer 16 may extend in only one part of the radially inner part of the side wall 15. If there is a plurality of superimposed layers 16, they may be of different radial heights. By these two latter means, it is possible to form in the same side wall 15 a more supple zone and a stiffer zone in the radial direction whilst conserving for the whole of the side wall 15 a radial suppleness which is smaller than for the side wall 14. In any case, the more reinforced side wall 15 reduces the lateral flexibility of the whole of the tyre in accordance with the desired aim.

The tyre shown in Figure 2 is generally similar to that of Figure 1 but in this case the left hand side wall is rendered stiffer by using a side wall 15 made of a rubber whose hardness is greater than the rubber of the side wall 14. The same result may be obtained with a side wall 15 with rubber of the same hardness but thicker, or by the two means combined.

In the tyre shown in Figure 3, the right half 18 of the carcass is constituted by one or other plies of radial cords whilst the left half is constituted by one or more cross-laid pairs 19 of layers of parallel cords, for example, at an angle of 60° as in the case of tyres with ordinary cross-laid carcass plies. The two halves of the carcass can be joined along the mid-circumferential plane as shown, or can even overlap underneath the breaker 12 or can stop at the shoulders of the tyre.

The tyre shown in Figure 4 comprises a carcass wherein the side wall 15 is reinforced in its radially inner part by means of a filler strip 20 placed around the bead wire 17, this filler strip extending half way up the side wall whilst gradually becoming narrower. The other bead comprises a filler strip 21 located in the region of the bead only. The two strips 20—21 may have the same hardness or the strip 20 may be harder than strip 21.

In the case of Figure 5, the side wall 15 is rendered stiffer by reinforcing its radially inner part with the aid of a flipper strip 22 extending into this part of the side wall whilst the other bead of the tyre does not comprise any flipper or only a flipper of ordinary dimensions.

The tyre shown in Figure 6 has the peculiarity of having beads 23—24 of different minimum diameter. The left hand bead 23 of larger minimum diameter leads to a side wall 15 which is shorter than the side wall 14 and consequently less supple than the latter in the radial direction. This tyre necessitates the use of a special rim 25 with supports 26—27 of different diameters for each bead but it will be noted that the assembly of the tyre on such a rim is simplified since the bead 23 may easily clear the right hand flange of the rim.

In the tyre shown in Figure 7, the beads are the same diameter but the side wall 15 is rendered less supple by giving it, during moulding, a radius of curvature "R" which is greater than the radius of curvature "r" of the side wall 15.

Other means may also be used for obtaining the desired result. One may, for example, utilise a carcass ply or plies whose part corresponding to the side wall 15 is calendered with a rubbery mixture which is harder than that utilised for the part of the ply or plies corresponding to the side wall 14. This may be conveniently obtained by utilising thin

layers of carcass plies cut out from the calendered fabrics separately with the calendering mixtures of different hardness.

As indicated above, it is preferable to mount the tyres according to the invention so that the side wall with the greater radial suppleness is placed on the outboard side of the wheel with respect to the vehicle so as to reduce to a minimum the drift to the outboard side whilst driving round a bend.

In order to produce the correct mounting and to avoid errors in the relative position of the tyres of a vehicle the face of the tyre which is to be mounted on the outboard side can be indicated by any known means. One of these means consists in producing the more supple side wall 14 of a white mixture. As this type of mixture is generally more supple than the ordinary black mixtures, this property may be put to profit in order to give the side wall 14 the desired relative suppleness.

WHAT WE CLAIM IS:—

1. A pneumatic tyre comprising a circumferential inextensible breaker layer disposed underneath the tread, wherein at least the radial inner part of one of the side walls is reinforced so that the said reinforced sidewall presents a radial suppleness which is less than that of the other side wall.

2. A tyre as claimed in claim 1, wherein the part of the carcass corresponding to one of the side walls comprises a larger number of reinforcing layers than the part of the carcass corresponding to the other side wall thereof.

3. A tyre as claimed in claim 1, wherein the part of the carcass corresponding to one of the side walls comprises cross-laid plies whilst in the other side wall the carcass is constituted by radial cord plies.

4. A tyre as claimed in claim 1, wherein that part of the carcass corresponding to one of the side walls comprises plies calendered with a rubbery mixture which is harder than the calendering mixture of the carcass plies in the other side wall.

5. A tyre as claimed in claim 1, wherein the side wall rubber of the reinforced side wall is thicker than that of the other side wall.

6. A tyre as claimed in claim 1, wherein the reinforced side wall is made of a rubbery mixture which is harder than that of the other side wall.

7. A tyre as claimed in claim 1, wherein one of the side walls is reinforced only over part of its radial height, in the radially innner zone adjacent the bead, for a distance greater than in the other side wall.

8. A tyre as claimed in claim 7, wherein the reinforcement is made by placing in the bead corresponding to the one side wall a filler strip extending into the side wall further than a filler strip in the other bead and optionally made of a harder material than that in the other bead.

9. A tyre as claimed in claim 1, wherein the bead corresponding to the less supple side wall is reinforced by flipper strips extending into the radially inner part of the side wall, the other bead having no flipper strip or a flipper strip which does not extend as far into the corresponding side wall.

10. A tyre as claimed in claim 1, comprising beads of different minimum diameters, the bead of greater minimum diameter corresponding to the side wall which is less supple in the radial direction.

11. A tyre as claimed in claim 1, wherein the less supple side wall has in radial cross section containing the tyre axis a radius of curvature which is larger than that of the more supple side wall.

12. A tyre as claimed in any one of the preceding claims, wherein the more supple side wall is the outboard side wall of the tyre.

13. Pneumatic tyres, substantially as hereinbefore described, with reference to the various Figures of the accompanying drawings.

BARON & WARREN,
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